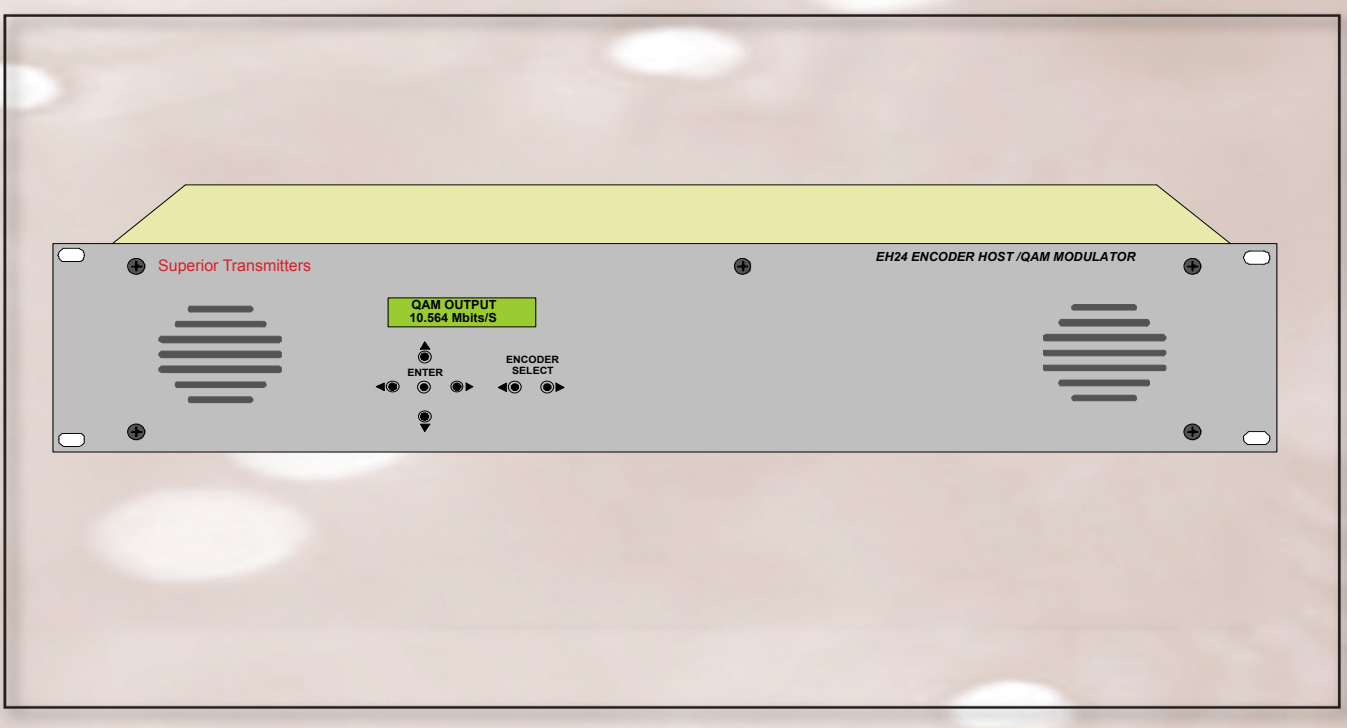
Superior Broadcast LLC

EH24A Encoder Host & SDE24 SD Dual Encoder

Instruction Manual



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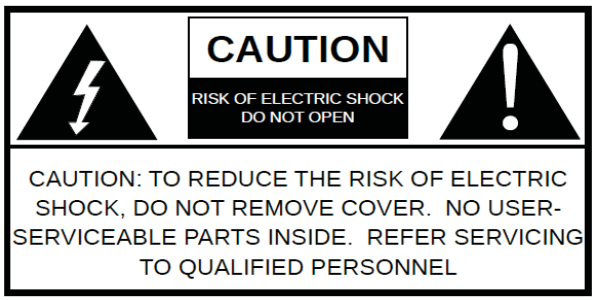
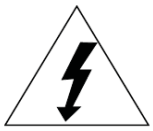
Caution Statements:

WARNING: TO PREVENT FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE TO RAIN OR MOISTURE


CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL

A product and cart combination should be moved with care. Quick stops, excessive force and uneven surfaces may cause the product and cart combination to overturn.



The lightning flash with arrow head symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE.
DO NOT OPEN THE CABINET, REFER SERVICING TO QUALIFIED PERSONNEL ONLY.

CAUTION: TO PREVENT ELECTRIC SHOCK, DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

ATTENTION: POUR PREVENIR LES CHOCS ELECTRIQUES, NE PAS UTILISER CETTE FICHE POLARISEE AVEC UN PROLONGATEUR, UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.

Important Safety Instructions:

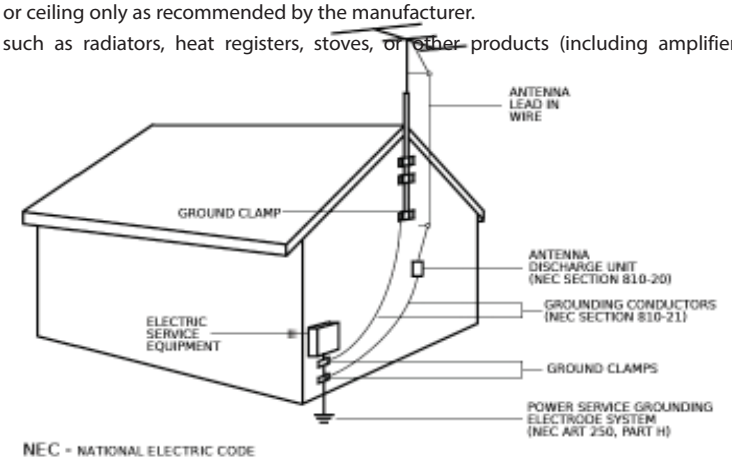
1. Read Instructions: All the safety and operating instructions should be read before the product is operated.
2. Retain Instructions: The safety and operating instructions should be retained for future reference.
3. Heed Warnings: All warnings on the product and in the operating instructions should be adhered to.
4. Follow Instructions: All operating and use instructions should be followed.
5. Cleaning: Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleansers. Use a damp cloth for cleaning.
6. Attachments: Do not use attachments that are not recommended by the product manufacturer as they may cause hazards.
7. Water and Moisture: Do not use this product near water—for example, near a bathtub, wash bowl, kitchen sink or laundry tub; in a wet basement; or near a swimming pool; and the like.

Important Safety Instructions (continued)

8. Accessories: Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult, and serious damage to the product. Use only with a cart, stand, tripod, bracket, or table recommended by the manufacturer, or sold with the product. Any mounting of the product should follow the manufacturer's instructions, and should use a mounting accessory recommended by the manufacturer.
9. A product and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product and cart combination to overturn.
10. Ventilation: Slots and openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or similar surface. This product should not be placed in a built-in installation such as bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.
11. Power Sources: This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supplied to your home, consult your product dealer or local power company. For products intended to operate from battery power, or other sources, refer to the operating instructions.
12. Grounding or Polarization: This product may be equipped with a polarized alternating-current line plug (a plug having one blade wider than the other). This plug will fit into the power outlet only one way. This is a safety feature. If you are unable to insert the plug fully into the outlet, try reversing the plug. If the plug should still fail to fit, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the polarized plug. Alternate Warnings – If this product is equipped with a three-wire grounding- type plug, a plug having a third (grounding) pin, the plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the grounding-type plug.
13. Outdoor Antenna Grounding: If an outside antenna or cable system is connected to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Article 810 of the National Electrical Code, ANSI/NFPA 70, provides information with regard to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.
14. Power-Cord Protection: Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the product.
15. Lightning: For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna or cable system. This will prevent damage to the product due to lightning and power-line surges.
16. Power Lines: An outside antenna system should not be located in the vicinity of overhead power lines, other electric light or power circuits, where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them may be fatal.
17. Overloading: Do not overload wall outlets, extension cords, or integral convenience receptacles as this can result in a risk of fire or electric shock.
18. Object and Liquid Entry: Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
19. Servicing: Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
20. Damage Requiring Service: Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
    a) When the power-supply cord or plug is damaged,
    b) If liquid has been spilled, or objects have fallen into the product,
    c) If the product has been exposed to rain or water,
    d) If the product does not operate normally by following the operating instructions.

    Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation, e. If the product has been dropped or damaged in any way, and f. When the product exhibits a distinct change in performance—this indicates a need for service.
21. Replacement Parts: When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. Unauthorized substitutes may result in fire, electric shock or other hazards.
22. Safety Check: Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.
23. Wall or Ceiling Mounting: The product should be mounted to a wall or ceiling only as recommended by the manufacturer.
24. Heat: The product should be situated away from heat sources such as radiators, heat registers, stoves, or other products (including amplifiers) that

NOTE TO CABLE INSTALLER:
THIS REMINDER IS PROVIDED TO CALL THE CATV SYSTEM INSTALLER'S ATTENTION TO ARTICLE 820-40 OF THE NEC THAT PROVIDES GUIDELINES FOR PROPER GROUNDING AND, IN PARTICULAR, SPECIFIES THAT THE CABLE GROUND SHALL BE CONNECTED TO THE GROUNDING SYSTEM OF THE BUILDING, AS CLOSE TO THE POINT OF CABLE ENTRY AS PRACTICAL.


ANTENNA LEAD IN WIRE
GROUND CLAMP
ANTENNA DISCHARGE UNIT (NEC SECTION 810-20)
GROUNDING CONDUCTORS (NEC SECTION 810-21)
ELECTRIC SERVICE EQUIPMENT
GROUND CLAMPS
POWER SERVICE GROUNDING ELECTRODE SYSTEM (NEC ART 250, PART H)

NEC - NATIONAL ELECTRIC CODE

Example of antenna grounding as per National Electrical Code, ANSI/NFPA 70

Specifications

SDE24 DUAL PROGRAM ENCODER MODULE

ANALOG INTERFACE

Composite video Inputs:	2 composite inputs, one for each program
Composite Video Input Level:	1 Volt p-p ± 3 dB
Audio Inputs, for 2 programs:	RCA type for L and R audio channels, 2 sets
Audio Input Level:	1 Vrms or 2 Vrms user selectable and user adjustable audio gain ± 15 dB

MPEG ENCODER

Encode Format - #1 input:	MPEG2 or MPEG4 H.264, selectable
Encode Format - #2:	MPEG2 only
Input Encoding Bitrate:	Constant Bitrate: 1 Mbps to 8 Mbps
Video Adjustments:	Brightness, Contrast, Saturation, Hue

AUDIO ENCODER

Selectable Types:	AC-3 Dolby digital Stereo OR MPEG1, Layer 2 (MP2)
Dolby Digital Encoder:	Manufactured under license from Dolby Laboratories.
Output bitrate:	User-selectable from Ethernet Control Interface; 128, 192, 320, 384 Kbps

Output:	The output of each SDE24 module is connected internally to the multiplexers that are included in the EH24A chassis.

SDE24EAS MODULE

Description:	MPEG2 Encodes NTSC EAS alert program. Used to add EAS to an EH24A system. Can be used for SCTE18 operation, for program replacement in all SDE24 encoders, or both.
Usage:	Only one SDE24EAS is required per headend. Must be inserted into slot number 6 of the master EH24A chassis.

ASII MODULE

Description:	ASI input module for inputting an EAS program that is looped out of the master EH24A(ASI Out) (containing the SDE24EAS) and also for inputting low speed data for DTA channel mapping and codeupdating.
Usage:	Used in an EH24A to add DTA data or used in an EH24A, for EAS alert programming that is being sourced by a 'master' EH24A/SDE24EAS.

EH24A CHASSIS

Program Filtering and Grooming:	Encoded programs may be disabled or sent to one or both output ports - ASI or QAM, user selectable. The output timing is restamped and null packets are managed as required.
Multiplexer:	Built in multiplexer circuitry combines the outputs of all enabled encoders in an EH24A into multiprogram transport streams, one to the QAM output and one to the ASI output.
MPEG Program Numbers:	MPEG program numbers in the output transport stream by default will be assigned sequentially, corresponding to the encoder number. The leftmost encoder input, as viewed from the rear panel, will be # 1. If the Ethernet remote access is used, the MPEG and virtual channel (major and minor) numbers may be user selected to any desired MPEG-legal numbers and program names, up to 7 characters in length, may be added.
ASI Output:	Any or all of the enabled encoders may be directed to the ASI output by means of the user selectable program filter. If EAS operation is used, this output can be assigned to loop the EAS alert program to additional EH24As. It can also loop DTA data.

Specifications subject to change without notice or obligation

Specifications (continued)

QAM Modulator:	Any or all of the enabled encoder outputs may be directed to the QAM Modulator by means of the user selectable program filter.
Output Symbol Rate:	1 to 7 MSps
Modes/FEC:	ITU-A: 16, 32, 64, 128, 256, 512,1024 QAM ITU-B (DigiCipher): 64, 256, 1024 QAM
I/Q Phase Error:	Less than 1 degree.
MER:	Greater than 38 dB with blind EQ

UP CONVERTER RF OUT

Output Frequency Range:	54 to 1002 MHz
Channel Plans:	CATV STD, HRC, IRC, BROADCAST
Frequency Stability:	± 5 ppm
Output Level Accuracy:	± 1 dB
Output Level:	45 dBmV to 61 dBmV, adjustable
Output Level Accuracy:	± 1 dB
Phase Noise:	-101 dBc @ 10 kHz offset
Broadband Noise:	Less than -12 dBmV (6 MHz BW@ ± 12 MHz)
Output Impedance:	75 Ohms, RL 14 dB or better, 54 - 1002 MHz
Spurious outputs:	- 60 dBc from 40 to 1000 MHz

GENERAL

AC Power:	90 to 264 VAC / 47 - 63 Hz, 70 W maximum
Operating Temperature:	0 deg to + 50 deg C
FCC Approvals:	The EH24A and the encoder modules have been verified as complying with part 15 of the FCC rules.

MECHANICAL

EH24A:	14 1/4" D x 3 1/2" H x 19" W, 9.5 lbs
SDE24, SDE24EAS, ASII:	8" D x 1 3/8" W x 3 1/4" H, approx. 0.5 lbs

Specifications subject to change without notice or obligation.

General Description

General Description

EH24A

The Drake model EH24A, encoder host, is the core multiplexer, QAM modulator, up-converter, ASI output, user interface, and power supply for the SDE24, HDE24, and SDI24A encoder modules. Up to six encoder modules can be installed into the EH24A via rear panel access. SDE24 encoders can encode one or two programs, depending on whether MPEG2 or MPEG4/H.264 encoding is used (see below), per module. Typical applications are to provide MPEG video in MDUs, medical facilities, libraries, stadium video networks, private cable and other QAM applications. The EH24A may be used in Edge or headend applications. There are two multiplexers in the EH24A, one providing an ASI output stream and one providing a stream to the built in QAM modulator/upconverter. The latest firmware release provides EAS implementation and allows low speed data streams to be added to the output for purposes such as DTA channel mapping and code upload.

SDE24

Each SDE24 module contains two encoders and if MPEG2 encoding is desired for two programs, two MPEG2 transport streams can be generated. If MPEG4, H.264 encoding is desired, each SDE24 module can encode one program to an H.264 output stream. Another option is to encode one program in MPEG2 and the second program in H.264. The SDE24 accepts either NTSC or PAL video inputs.

SDE24EAS

This is a specialized version of the SDE24 to be used, when EAS is needed, to encode the EAS program. EAS mode is provided by one of 2 methods, or both.

1) By installing the SDE24EAS module in slot 6 of the EH24A. This module has only a single composite input instead of the two inputs of the standard SDE24. It's video and audio input will be provided by an external EAS contoller providing a NTSC composite alert message. When EAS is activated, the transport stream, created by the SDE24EAS, replaces the transport streams that were coming from the other encoder modules in the EH24A. All programs will then become the EAS alert program. Only one SDE24EAS is required per headend. The alert can be encoded in either MPEG2 or MPEG4/H.264. All programs will be the same.

2) SCTE18 mode. In this mode, when an EAS alert is activated, the EH24A will place the SCTE18 table into the transport stream. The SDE24EAS will encode the alert program. SCTE18 capable receivers are told where to tune.

EH24A Features

The EH24A encoder host platform is a 19" rack mountable chassis that is 2 RU tall and can accept up to six modules that are inserted into slots via the rear panel.

SD Encoding: The SDE24 is the SD dual encoder module. Up to six of these modules could be installed in the EH24A. Programs can be encoded in MPEG2 or MPEG4/H.264 (AVC). Audio is encoded using a choice of Dolby Digital encoding or MPEG1, layer 2 (MP2)encoding.

EAS Message Encoding: If EAS is to be utilized, then up to 10 SD MPEG2 programs or 5 SD H.264 programs, or a mix, may be encoded in each EH24A in addition to an EAS message program that is encoded in slot 6 of just one 'master' EH24A. One SDE24EAS is required per headend to be installed in the 'master' EH24A. Additional 'slave' EH24As can be included via simple ASI looping through each EH24A using an ASII card in slot 6 of all slave EH24As. The EH24A supports the emergency alert system in two ways. SCTE18 table support is provided and also substitution of normal program video with EAS program video, on all EH24A encoded program PIDs, is provided. Either method or both may be operator selected.

Program Filtering and Multiplexing: The EH24A contains transport stream multiplexers that can multiplex any or all of the program streams from the encoders. The user may select what programs from the encoders to include in the QAM output channel and also the user can select, independent of the QAM output, what programs to output via the DVB-ASI port. The QAM RF output can be specified for either off-air or CATV frequency plans in the 54 to 1002 MHz spectrum. The EH24A and installed encoder modules are powered by a built in power supply.

DTA Data Support: One input slot in an EH24A can be used to input low speed data via ASI that may be used by system DTAs (Digital Transport Adapters). A Drake created PC program can be used to generate the data that would be then input to the EH24A. This data generates a transport stream to provide a channel map (SCTE65 tables) for the DTAs. Also, firmware update data can be sent to the DTAs if needed.

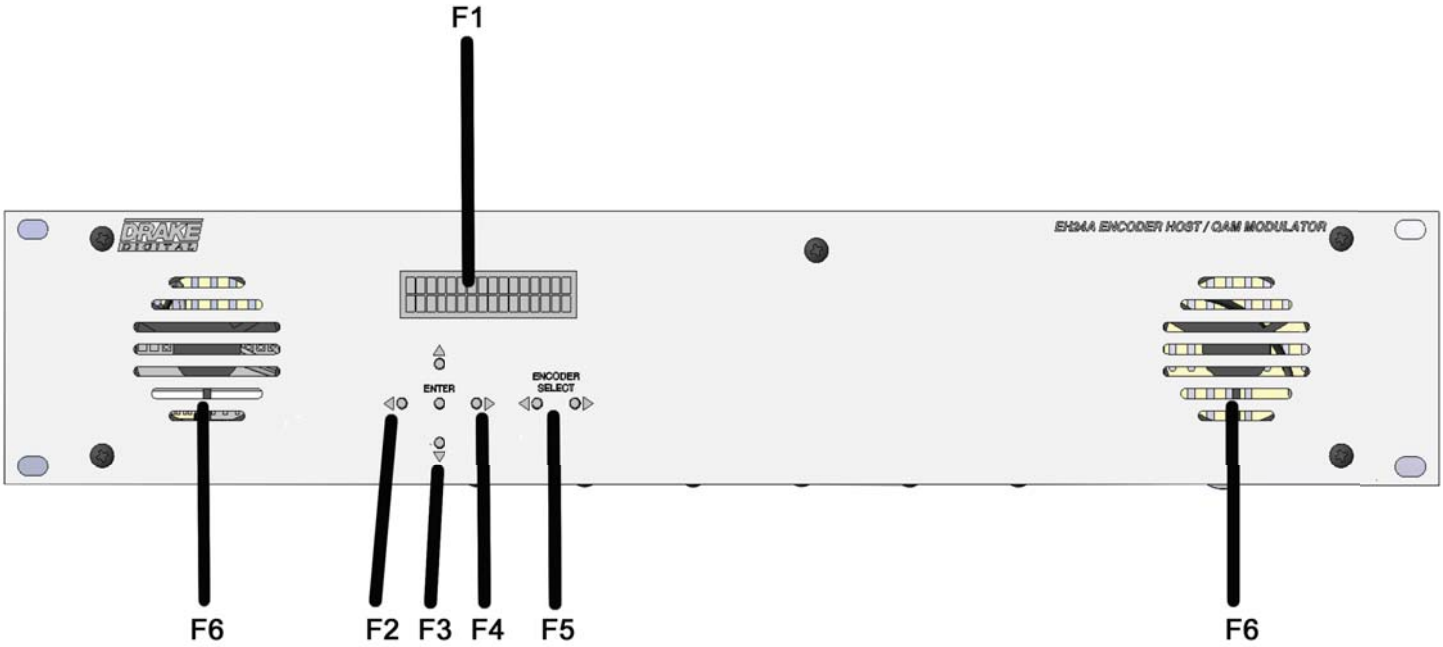
ASII: The Drake model ASII input module is supported to provide an ASI input for slave EAS operation and for DTA data input as described in previous paragraphs.

Installation and Mounting / Front Panel Controls

INSTALLATION AND MOUNTING NOTES

This equipment is designed to be installed in a standard 19" rack. When the unit is mounted above or below other rack mounted equipment, a 1U space (1.75") should be left between the unit and the other equipment to allow ambient air flow between the units. No space is needed between EH24A units themselves due to the ventilation provided by their built in fans.

Connect the AC line cord to an appropriate source of 120 volt, 50/60 Hz AC power. The EH24A is always on once the AC power cord is connected to its power source..



F1, LCD Display - This display presents the selected menu screen and the parameter settings. The backlight in the display is on when power is applied.

F2, Left and Right Buttons – Use the left and right arrow buttons to navigate from screen to screen to view a parameter setting within a particular program group. These buttons are operational in the view mode or the program mode. Using only these buttons will not change any parameter setting.

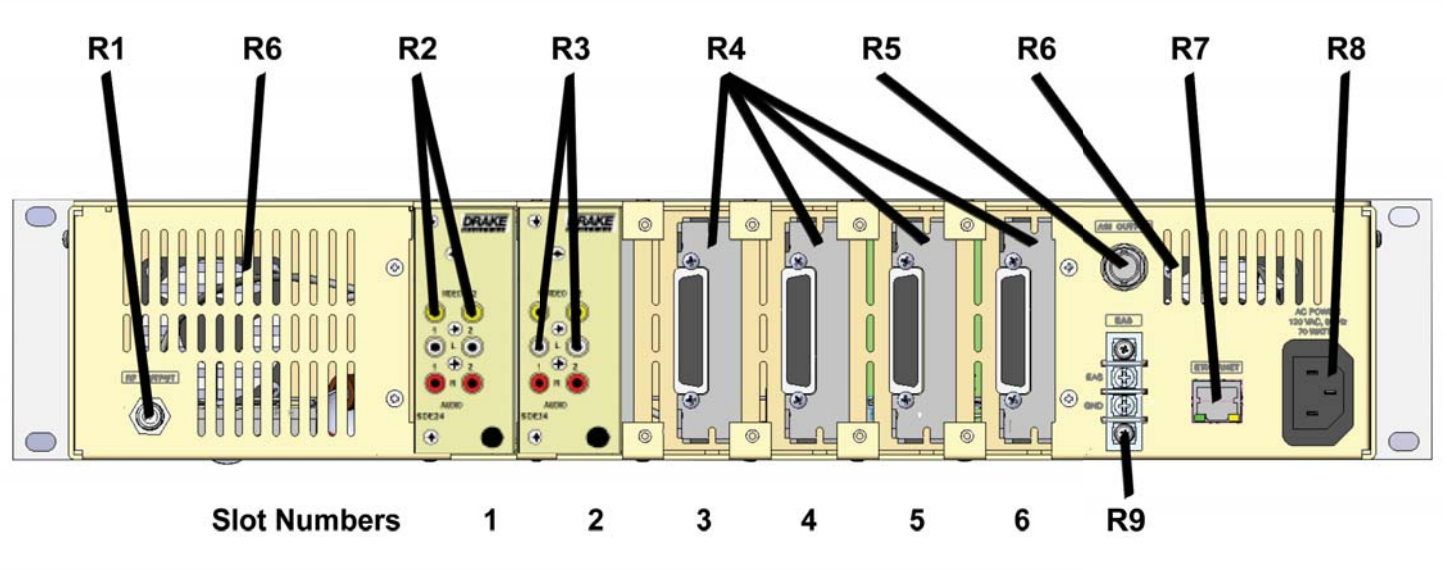
F3, Up and Down Buttons – Use the up and down arrow buttons to change the value of a viewed parameter setting. The unit must be in the program mode in order for these buttons to become active for changing a parameter setting. If the unit is not in the program mode, pressing the Up button will show the version number of the EH24A firmware. Repeatedly pressing the Down button will toggle between showing the Mbits/S for QAM and the Mbits/S for ASI.

F4, ENTER Button - Use the ENTER button to enter the program mode or to save and load a new setting or settings after adjustment. Hold for approximately 2 seconds until the bottom line of the display starts to flash to enter the program mode. After entering the program mode, momentarily pressing the ENTER button again will load and save any settings that may have been changed using the Up and Down buttons.

F5, Left and Right ENCODER SELECT Buttons - Use the left and right ENCODER SELECT buttons to navigate through the available SDE24 Encoders and EH24A settings The selection of the desired parameters for the selected encoder or EH24A can then be made using the LEFT and RIGHT (F2), UP and DOWN (F3), and ENTER (F4) buttons

F6, Ventilation Fan Vents: These are the intake vents for the two ventilation fans. The exhaust vents are on the back of the unit. Do not cover any of these vents as overheating may result.

Rear Panel Connections



REAR PANEL CONNECTIONS

R1, RF OUTPUT – This type "F" connector is the high level (+45 to +61 dBmV), 54 to 1002 MHz, output from the EH24A RF output section.

R2, VIDEO 1 & 2 - These two RCA type connectors color coded yellow provide two separate video inputs to the SDE24 Encoder.

R3, AUDIO 1 & 2 - These four color coded RCA type connectors provide audio Left (white) and Right (red) inputs to the SDE24 Encoder.

R4, This is space available for additional SDE24 Encoders which may be installed in the EH24A Encoder Host.

R5, ASI OUTPUT - This BNC type connector provides ASI output of the multiplexed transport streams from selected encoders.

R6, Cooling Air Vents

R7, Ethernet Port - Connection to a PC or modem for use with remote control / monitoring program or for firmware upload.

R8, AC Line Cord Socket – For connection to the mains AC power source. The removable line cord allows for operation in various countries. Use an appropriate cord for your needs that has been recognized by a certified safety agency. This unit is usually supplied with a cord for USA operation on 120 VAC.

The power supply automatically accepts a mains supply from 90 to 264 VAC, 47 to 63 Hz. Power consumption will vary depending on the number of modules installed but worst case consumption is 70 W.

R9, EAS - This terminal is used to supply the EH24A with a contact closure when the EAS is activated, as determined by an external EAS controller/receiver. The external EAS controller will supply a contact closure output for connection to the EH24A EAS and GND terminals. Grounding the EAS screw terminal, through the contact closure in the controller, will signal the EH24A that an EAS event has occurred. If EAS has been programmed and the EAS encoder installed, the EH24A will respond appropriately.

Ethernet Control Interface Configuration

There are two options for the ethernet control interface setup. If your ethernet network has a DHCP server available, and you would like to use that to configure the IP address of your EH24A, you may enable DHCP on the EH24A. When the unit's front panel has exited from configuration mode, you can press the button above ENTER twice to view the IP address that was discovered by DHCP.

If your network does not have a DHCP server, or you choose not to use DHCP for configuration (this is the recommended configuration, to avoid your EH24A's IP address changing in the future), you must obtain an IP address, subnet mask, and default gateway from your network administrator. Once you have determined the correct values for your particular network, set these values from the front panel.

Once the unit has an assigned IP address, you can view and change its settings from a web browser. For instance, if the unit's IP address were 10.0.0.1, you would load http://10.0.0.1 in your web browser to view and configure your EH24A. The username and password required to log into the unit are both set from the front panel.

Once the EH24A web server has been loaded from your browser, you should see the login dialog (see Fig. 1). Enter the username and password (configurable via the front panel interface) and click LOG IN.

Once you are logged in to the EH24A, you will be presented with the status page (see Figure 2). Along the top edge of the page, there are five tabs listed; each tab allows you to view and configure different parts of the encoder host. The Status tab gives the overall status of the whole unit, including firmware versions, output bit-rates for all 4 outputs, output buffer usage, and links to the relevant encoder manuals.

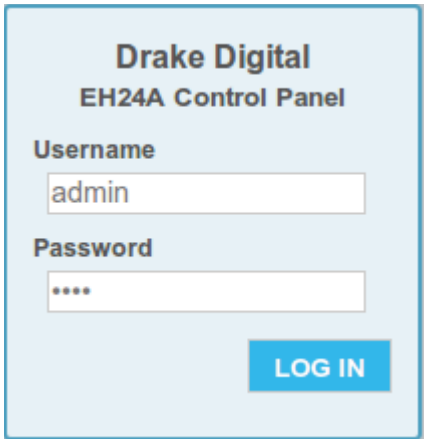


Figure 1: EH24A Login Dialog

Ethernet Control Interface Configuration (Continued)

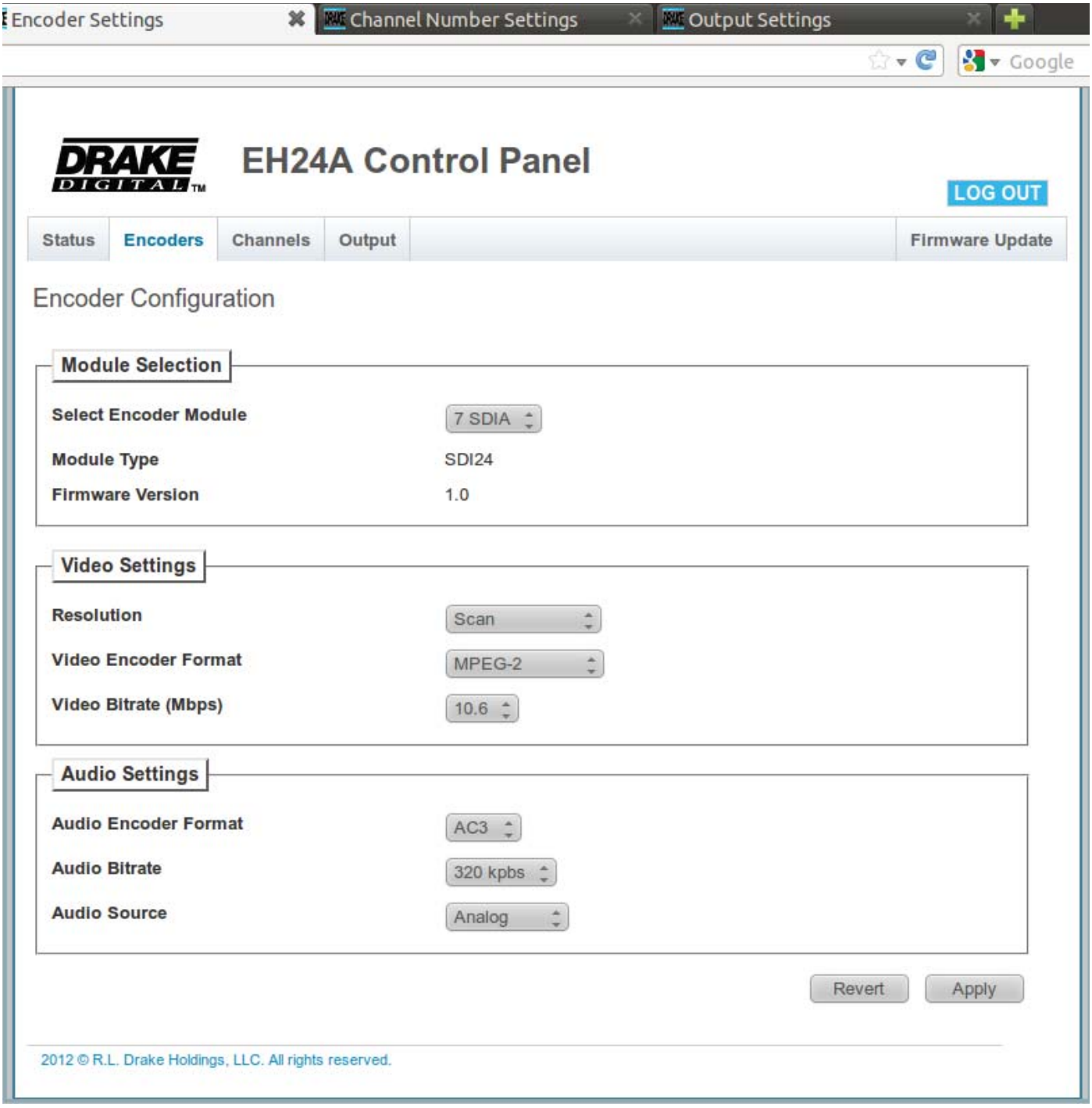


Figure 2: EH24A Encoders Tab

The Encoders tab allows you to set each encoder's individual parameters. Select an encoder module from the drop-down menu, and the appropriate setting selections will be displayed.

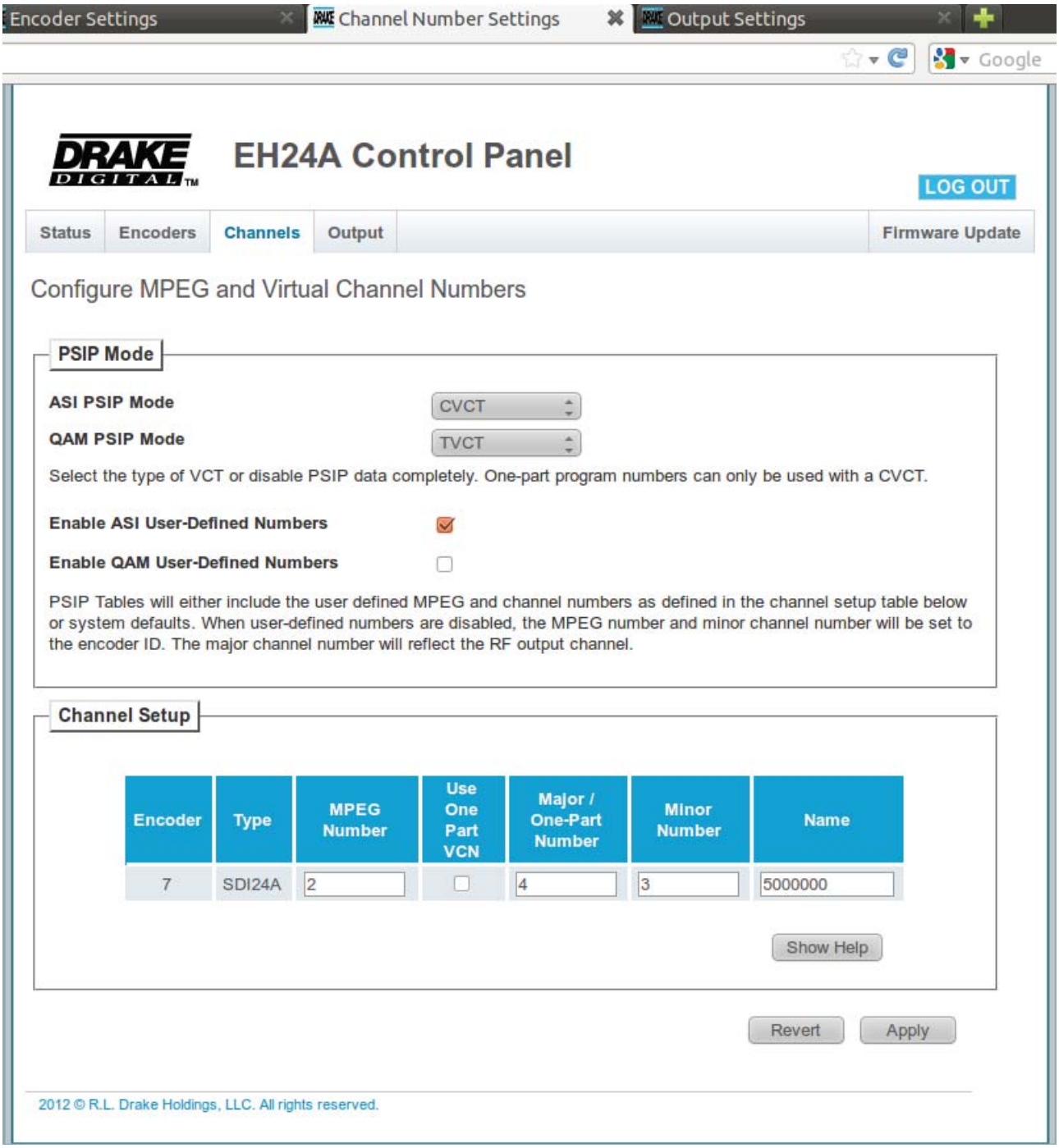


Figure 3: EH24A Channels Tab

The Channels tab provides an interface to configure the virtual channel mappings for this encoder host. If PSIP is enabled, this page will display a screen that looks like Figure 3; for each encoder output, the MPEG program number can be modified, along with the Major and Minor channel numbers. If one-part virtual channel numbers are desired, the PSIP Mode must be set to CVCT and the Minor number for each channel should be set to 0.

The Output tab provides an interface to set all modulator output settings for the unit. A screenshot of this tab is shown in Figure 4. This tab selects the DTA and EAS modes, channel bitrates, QAM settings, and the mapping from encoders to output channels. For settings like the DTA/EAS options, more options appear as you enable the sub-systems.

Ethernet Control Interface Configuration (Continued)

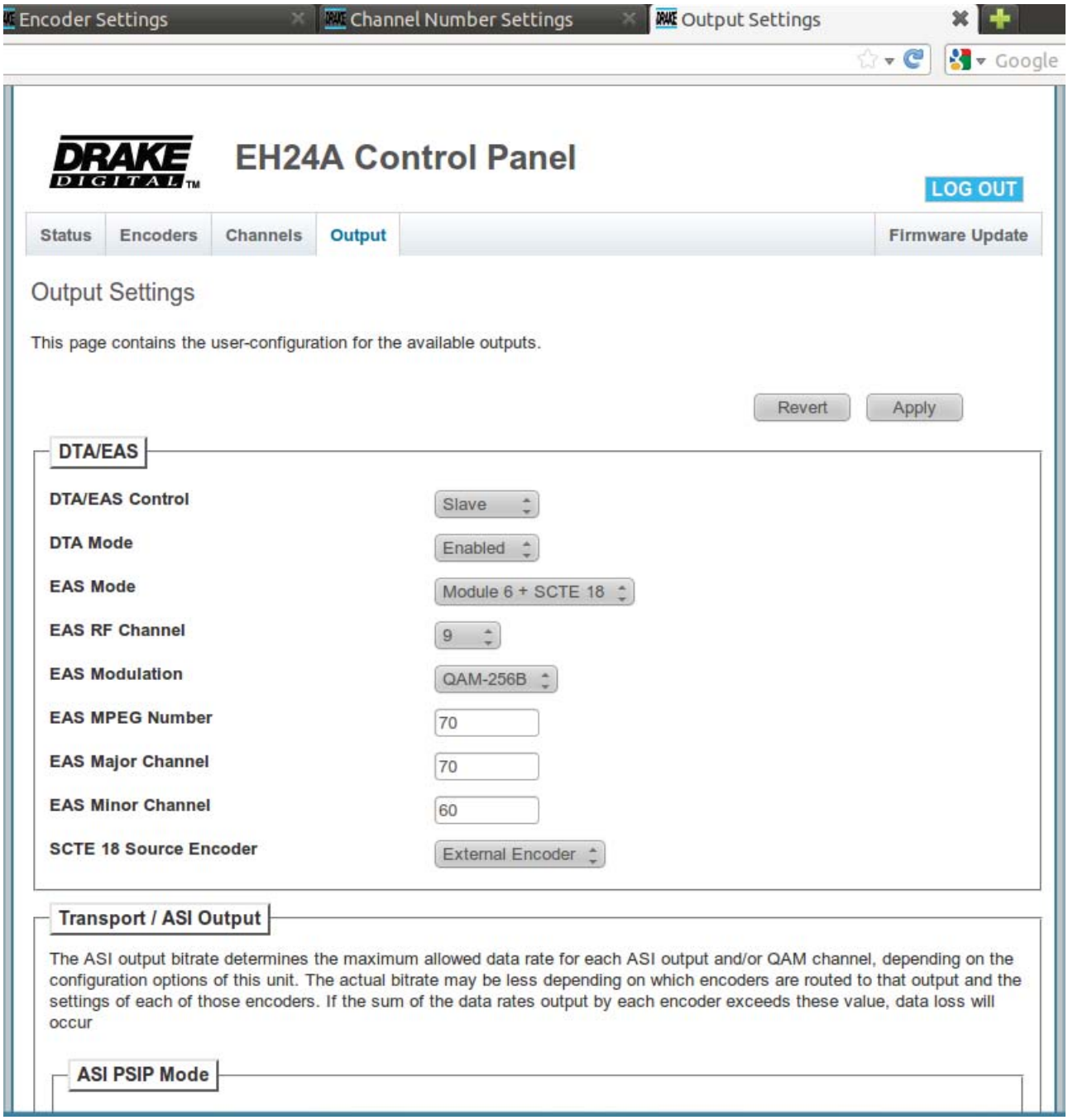


Figure 4: EH24A Output Tab

Ethernet Control Interface Configuration (Continued)

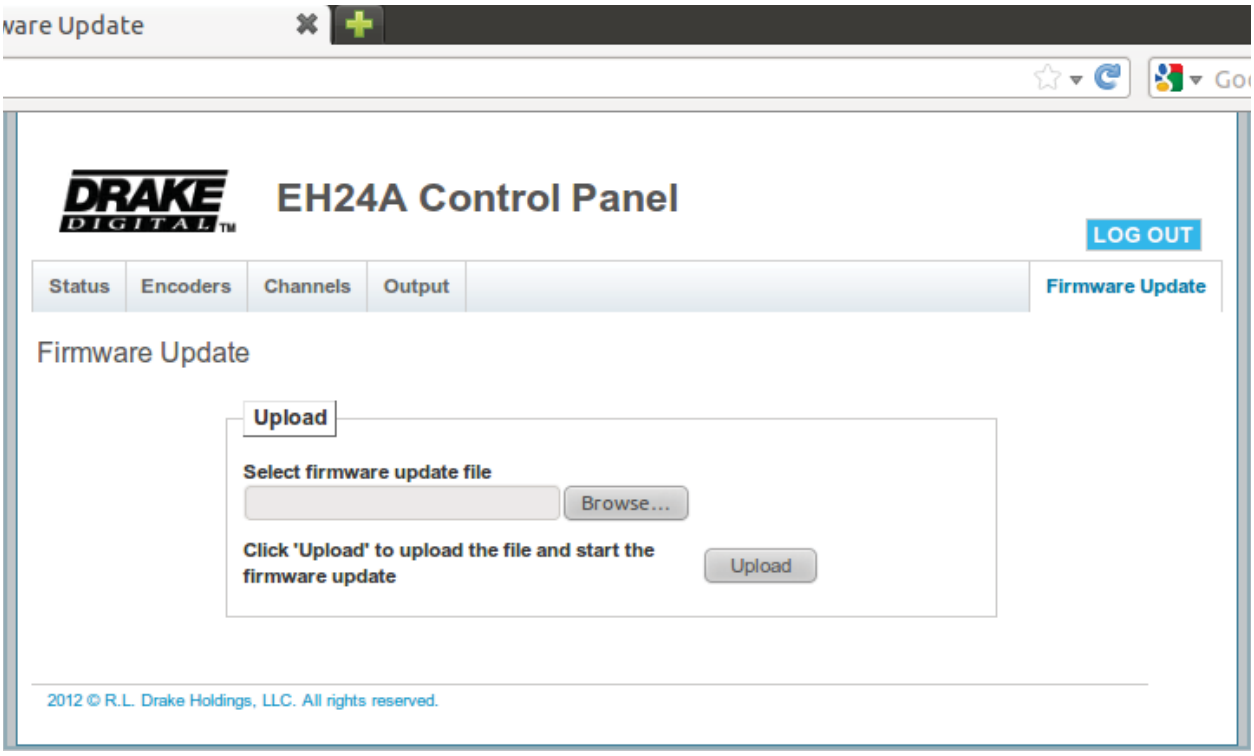


Figure 5: EH24A Firmware Update Tab

The Firmware Update tab allows you to update all of the firmware on the unit with a single upload (see Figure 5). Once you have received a new firmware image for the unit, click on the Choose File button and select the provided firmware; click Upload to initiate the update. After a few minutes, the unit will restart with the new firmware. If a power loss occurs during update, the unit will recover automatically – if the firmware upload was not completed, it may be necessary to re-initiate the update process once power is restored.

Setup and Programming

Programming and viewing of the various setup and operating parameters is accomplished using the front panel back lit, two line, sixteen character wide LCD along with the two LEFT and RIGHT 'ENCODER SELECT' buttons and the five LEFT, RIGHT, UP, DOWN and ENTER buttons. The name of the parameter is on the top line of the display and the setting value is on the bottom line.

To observe a certain parameter setting without intending to change its value, just use the LEFT and RIGHT ENCODER SELECT buttons and the LEFT and RIGHT arrow buttons to navigate through the menus shown in the software flow chart on the previous page. The current setting for each parameter is shown on the bottom line of the display. Note that depending upon certain settings, some screens are not needed and will be skipped.

To make a change in the displayed parameter and its setting and if this is the initial setup, you will want to enter the 'program' mode. To do this, press the ENTER button that is located in the center of the four arrow buttons and hold in for several seconds until the bottom line of the display begins to flash.

After you are in the program mode (bottom line of screen flashing) use the LEFT and RIGHT arrows to navigate among screens and use the UP and DOWN arrows to change the parameter setting. When ENTER is pressed, the new settings will be loaded and stored and the unit will exit the 'program' mode. You may wish to not press ENTER until you have gone through all screens and settings and then press ENTER to save and load all changes in one step, OR you can store just one or several parameters at a time and reenter program mode to set the next. Either method is acceptable.

This section provides additional details regarding the selectable items shown in the 'program' mode on the Software Flow Chart on page 10.

SETUP: EH24A

USER NAME: Variable – this sets the username for the ethernet control interface authorization; this field is case-sensitive

PASSWORD: Variable – this sets the password for the ethernet control interface authorization; this field is case-sensitive

(for first time setup, the default USER NAME is "admin" and the default PASSWORD is "EH24")

HOST NAME: Variable – this sets the display hostname for the ethernet control interface

DHCP: ENABLED, DISABLED – this configures the ethernet control interface to use DHCP for its IP configuration settings when enabled, or to use the static IP configuration that follows when disabled

IP ADDRESS: Variable – this sets the ethernet control interface's static IP address when DHCP is disabled

SUBNET MASK: Variable – this sets the ethernet control interface's IP subnet netmask when DHCP is disabled

GATEWAY ADDRESS: Variable – this sets the default gateway for the ethernet control interface when DHCP is disabled

OUTPUT MODE: This menu provides a means to determine whether the EH24A output should be QAM and ASI or ASI output only.

PACKET DELAY: This menu allows the user to determine the packet delay. The choices are 0 to 200 microseconds. A good default value is usually 50 uS. If pixilation is seen in some programs, the delay may need to be increased. Increase in small increments as too much delay can cause a buffer overflow -this will be indicated in the front panel LCD.

DTA/EAS CONTROL: The DTA control is used when EH24As are used to supply the QAM signals to DTA set top boxes. It allows for an ASI stream, generated by a PC to be input to the headend's Master EH24A. This control allows for generating a transport stream that provides a virtual channel map to the DTAs (Known as SCTE 65 tables), and/or provides code updated to the DTA's (in a format known as DSM-CC) so that they can be updated through the QAM channel transport stream. The choices are DISABLED, MASTER, and SLAVE.

DTA MODE: This menu choice allows the user to activate or deactivate DTA mode. The choices are ENABLE and DISABLE.

Setup and Programming (continued)

EAS MODE: EAS Control is provided by 1 of 2 methods:

Method 1: - By using the new SDE24EAS module. This module has only a single composite input instead of the 2 inputs of a standard SDE24. It is fed by an external EAS Controller source, that then is encoded by both encoders in the modified SDE24. When EAS is activated, the transport stream generated by the SDE24EAS is routed internally in the EH24A and replaces the transport streams coming from the other plugged in SDE24s. This way all MPEG programs coming out of the EH24A have the EAS video and audio on them. Note that when using this method only 1 SDE24EAS is required per headend, and is placed into the Module 6 slot of the Master EH24A.

Method 2: By using the newer digital standard for EAS (known as SCTE 18). In this mode, rather than each MPEG program being replaced by the EAS video, instead when the EAS is activated, a table is inserted into the transport stream. This table tells any SCTE 18 capable unit which RF channel to switch to and which MPEG program number to begin decoding. The receiving unit then switches to that program to display the EAS video and audio. When the EAS is deactivated, the receiving unit returns to its original channel.

The EAS MODE menu allows the user to select which EAS mode is desired. The choices are DISABLED, MODULE 6, SCTE 18, and MODULE 6 + SCTE 18.

EAS RF CHANNEL: This menu allows the user to determine on which RF channel EAS information will be outputted. Note that this menu will only appear if DTA/EAS is set to MASTER and EAS MODE is set to enable SCTE18. The choices are 2 through 158.

EAS MODULATION: Note that this menu will only appear if DTA/EAS is set to MASTER and EAS MODE is set to enable SCTE18. This menu allows the user to determine the type of modulation to be used for the EAS information. The choices are QAM64B or QAM256B.

EAS MPEG PROGRAM #: Note that this menu will only appear if DTA/EAS is set to MASTER and EAS MODE is set to enable SCTE18. This menu allows the user to determine on which MPEG program number the EAS information will appear. The choices are 1 thru 65535.

EAS MAJOR CHANNEL: Note that this menu will only appear if DTA/EAS is set to MASTER and EAS MODE is set to enable SCTE18. This menu allows the user to select on which major channel the EAS information will appear. The choices are 1 through 999.

EAS MINOR CHANNEL: Note that this menu will only appear if DTA/ EAS is set to MASTER and EAS MODE is set to enable SCTE18. This menu allows the user to determine the minor channel number on which the EAS information will appear. The choices are through 999.

ENCODER 1 THRU 12: These menu items provide the means for selecting the desired output mode of operation for each of the installed encoders. The available settings are DISABLED, QAM + ASI, ASI, and QAM.

QAM MGT/VCT: This menu item provides a means for the user to select either CVCT or TVCT tables or DISABLED for QAM operation. TVCT is the typical setting.

QAM MAJOR CHANNEL: The user may use this menu entry to define the QAM major channel number. The choices are OUTPUT CHANNEL or USER DEFINED using an external PC with Drake Digital Headend Remote Control Software.

ASI MGT/VCT: This menu item provides a means for the user to select either CVCT or TVCT tables or DISABLED for ASI operation.

ASI MAJOR CHANNEL: The user may use this menu entry to define the ASI major channel number. The choices are OUTPUT CHANNEL or USER DEFINED using an external PC with Drake Digital Headend Remote Control Software.

QAM MODE: This menu allows the user to set the modulation type for the output. Choices range from QAM-16A through QAM-1024B. 'A' suffixes indicate DVB compliant FEC and the B suffixes indicate DigiCipher II FEC encoding. Note that the output QAM mode usually must be QAM-256. For CATV systems using DigiCipher II, select the QAM-256B mode. For DISH Network QAM distribution or other DVB systems using DVB set tops, choose the QAM-256A mode.

Setup and Programming (continued)

GRAY ENCODING: This menu is only available when QAM modes QAM-16A through QAM-1024A, are selected. The choices are DVB and DAVIC. Gray Encoding is normally not used for video data.

QAM SYMRATE: Preset or Manual: If PRESET is selected, the symbol rate will be automatically set to the 'normal' rate based on the QAM mode that is selected and assuming a 6 MHz wide QAM channel. If MANUAL is selected, pressing the right or left arrow buttons will allow selection of symrates from 1.000 thru 7.000 MSym/Sec.

QAM SYMRATE: This menu item only appears of 'Manual' is selected in the previously described menu item. It allows selection of the output QAM baudrate or symbol rate. Set as required by the set top box.

INTERLEAVER: This menu item only appears if QAM-64B, QAM- 256B, or QAM-1024B is selected and provides the means to set the QAM modulator interleaver. Choose among the available selections based upon your system / set top box requirements. For typical 256-QAM DigiCipher II CATV systems, I128, J1 is the most commonly used interleave setting but many other choices are available. This menu does not appear in the adjust mode if the QAM mode is A (DVB) as there is only one choice in the DVB standard.

OUTPUT FORMAT: For normal operation, select NORMAL. For system level set up, choose CW to provide a CW carrier at the center frequency of the output channel for use in leveling a system when a QAM power meter is not available. To disable all RF output, select STANDBY. In the CW mode, the CW carrier can be measured on a spectrum analyzer without a need to apply a bandwidth correction or it can be measured with an analog meter tuned to channel center. The CW power measured will equal the channel QAM power when the modulator is returned to NORMAL output mode. Usually QAM signals are set 5 dB to 10 dB below analog NTSC channels when balancing a system.

PRBS menu entries are used for testing purposes only and should normally not be selected by the user.

OUTPUT CHANMAP, OUTPUT CHANNEL: Select the desired EIA CATV channel output using these two menus.

RF LEVEL: Select the desired RF output signal level. The available range is between +45 dBmV and +56 dBmV, selectable in 0.5 dB steps. The output accuracy is ± 1 dB.

SETUP: ENDODER xx

ENCODER SELECT: The LEFT and RIGHT buttons allow the user to scroll through the encoder numbers for each encoder installed in the EH24A as well as the EH24A itself. Use the LEFT and RIGHT buttons to select the encoder to be programmed.

VIDEO: This menu entry allows the user to select between SVIDEO and COMPOSITE video input for each selected encoder.

FORMAT: Either MPEG2 or MPEG4 H.264 may be selected as the output format for the selected encoder using this menu item. Encoder 2 on a given SDE24 has no option. It is forced to MPEG2.

BITRATE: This menu item allows the user to select the bitrate. The choices are from 1 to 8 Mbits per second.

INPUT: This menu allows the user to select between the NTSC or PAL video formats.

RESOLUTION: The resolution of the video output of each encoder may be selected from this menu item. The choices range from 720 x 480 thru 353 x 240 as shown on the software flow chart on page 10.

BRIGHTNESS, CONTRAST, SATURATION and HUE: These menu items allow the user to assign each of these parameters of the output video values from 0 to 255.

AUDIO ENCODER: The SDE24 includes audio encoders for Dolby Digital Stereo commercial encoding or MPEG1 Layer 2 audio encoding (MP2). In the USA, the majority of applications will use Dolby Digital (referred to within EH24A settings as " AC3") but if your network is using Annex A (DVB) set top boxes, they may require the MPEG audio selection. Some TVs and set top boxes will decode either mode but be sure to set the encoder to the mode used by other programming on your system to insure complete compatibility. The AUDIO ENCODE(R) menu allows you to select either AC3 or MP2. Use the up/dn arrow keys to toggle between the two settings.

MAX AUDIO IN: This menu entry allows the user to set the maximum audio input which may be input to the selected encoder. The choices are 1 Vrms or 2 Vrms.

AUDIO GAIN: The audio output level can be chosen from this menu item by selection of the appropriate gain. The values range from + 15 dB to - 15 dB. Audio output can also be completely eliminated using the 'MUTE' selection.

Operating Instructions

OPERATING INSTRUCTIONS – FROM THE FRONT PANEL

1) Connect video and audio inputs to desired encoder modules. Note, as viewed from the rear, the number 1 program will be on the left, the one closest to the RF output connector. The number 2 program will be the next input to the right.

2) Connect the outputs as desired.

3) Plug the EH24A into AC power. Allow 30 to 90 seconds for boot-up.

4) From the front panel, use the ENCODER SELECT buttons to choose among EH24A settings and settings for each encoder. Use the ENTER button to enter program mode and to save settings in memory. Use left and right arrows to select a parameter and then use the up or down arrows to change its value. Parameters values can only be changed when the unit is in the program mode as indicated by slow flashing of the front panel display. To enter program mode, press the ENTER key and hold for 2 to 3 seconds.

5) Press ENTER for 3 seconds to enter program mode.

6) Repeatedly press the ENCODER SELECT right or left arrow until the display shows: SETUP EH24A.

7) Repeatedly press the left or right arrows (on either side of the enter button) until the display reads ENCODER1. Press up or down arrows to select which output or both outputs that this encoder is to output to. Then press the right arrow once to advance to ENCODER 2. Choose output for this one. Proceed in this manner until all encoders have been directed to the desired outputs. ENCODERs 1 and 2 will be the first module, 3 and 4 the second module, 11 and 12 the sixth module, etc. If an encoder is installed but you don't plan to use it, be sure to choose the DISABLED choice for any such encoders.

8) Press the right arrow again after setting the 12th encoder. This should produce the QAM MGT/VCT screen. Usually select TVCT by using up or down arrows.

9) Press right arrow again and observe the QAM MODE screen. Use up or down arrows to select QAM mode. For example, QAM-256B would select 256 QAM with annex B FEC (DigiCipher FEC).

10) Press right arrow again and observe QAM SYMRATE. Set to PRESET. PRESET will be 5.057 MS/S for QAM-64B or 5.3606 MS/S for QAM-256B, etc. If a nonstandard rate is desired, choose MANUAL.

11) Press right arrow again and observe INTERLEAVER. Select I128,J1 unless you have a special requirement.

12) Press right arrow again and move to the OUTPUT FORMAT. Choose NORMAL. For testing/level setup – temporarily choose CW to produce a CW carrier in the center of the channel. Other PRBS choices are for testing only.

13) Press right arrow again and observe OUTPUT CHANMAP. Select the desired plan, usually CATV.

14) Press right arrow and observe OUTPUT CHANNEL. Select desired channel. The RF channel number being set will be used as the major channel number in the output stream.

15) Press right arrow and observe RF OUT. Choose desired RF out level.

16) Press right arrow and observe UNIT ID. If not using Ethernet remote control, choose 0.

17) Press the right arrow and observe Ethernet BAUDRATE. Set to 4800 unless otherwise directed.

18) Press the right arrow and observe that you are back to the ENCODER 1 screen.

Operating Instructions (continued)

At this point, you can press ENTER to store all of the choices on page 14. Actually, you could store after setting just one item or after two items, etc. But once you store a parameter(s), you must renter the program mode to make any additional adjustments.

All of these settings can be set using a PC connected via the Ethernet port or through the Ethernet connection via the DRAKE model SCTeci Control unit.

Having completed EH24A settings on page 14, you are now ready to setup each individual encoder.

19) Press ENTER for 3 seconds to enter program mode. Observe flashing display.

20) Use left or right ENCODER SELECT buttons to choose one of the installed encoders.

21) To set the encoder to typical default settings, press the up arrow, down arrow, and ENTER all at the same time. Hold the three buttons in for several seconds and release.

22) If any of the encoder settings need changed from the default values, re-enter program mode and adjust each encoder parameter as required.

23) Repeat from step 19 for each enabled encoder.

24) Press ENTER to store any unsaved changes.

Additional Information

ADDITIONAL INFORMATION

STANDBY MODE

The EH24A has a standby output mode which turns off the RF output. This can be used when it is desirable to temporarily disable the output without unplugging the AC line cord. Select DISABLED in the 'QAM MGT/VCT' menu. Individual encoders can be disabled or enabled when in the QAM mode from the 'ENCODER xx' menu.

OVER TEMPERATURE SENSOR

Temperature monitoring is built into this product. If inadequate ventilation is provided, overheating may occur. If this condition is detected, the default LCD message will change to OVER TEMP. If this occurs, the problem should be corrected as soon as possible. The unit will remain operational but the ventilation must be restored to prevent premature part failures due to overheating.

STATUS DISPLAYS

When the units are not in the program mode, status displays are shown. The default display shows the QAM OUTPUT Mbits/S. When the UP button is pressed, the version number of the EH24A firmware is displayed. The DOWN button toggles the display between QAM OUTPUT Mbits/S and ASI OUTPUT Mbits/S.

REMOTE CONTROL AND MONITORING

The EH24A may be used with the 'Drake Digital Headend Remote Control Software' program to allow remote monitoring or control. Only version 3.0 or newer version of the software is compatible with the EH24A. Connect the Ethernet cable coming from the PC or modem to the Ethernet IN port rear panel connector. Assign a UNIT ID (1 to 63) to use the remote program. Leave at, or set to, 0 if no remote access is desired.

EAS CONSIDERATIONS

Any headend using EAS and/or DTAs that includes more than one EH24A must be setup with one EH24A being the Master and all other EH24As being Slaves.

These setups require different configurations of the EH24A with the SDE24EAS and ASII plug in modules.

-If set as a Slave Unit, Module 6 must always be an ASII module.
-If set as the Master unit, then there are 4 possible configurations for what needs to be plugged into the Module 6 and the Module 5 slots.

DTA MODE	EAS MODE	Module 6 Plug-in	Module 5 Plug-in
DISABLED	SCTE 18	SDE24 or empty	SDE24 or empty
DISABLED	MODULE 6	SDE24EAS	SDE24 or empty
DISABLED	MODULE 6 + SCTE 18	SDE24EAS	SDE24 or empty
ENABLED	DISABLED or SCTE 18	ASII	SDE24 or empty
ENABLED	MODULE 6	SDE24EAS	ASII
ENABLED	MODULE 6 + SCTE 18	SDE24EAS	ASII

As shown above, if DTA MODE is ENABLED, then an ASII module must be present in the Master EH24A to receive the ASI stream from the PC. Whether it is plugged into Module 5 or Module 6 slot depends on whether the SDE24EAS is also required in the system or not.

All units at the headend are then daisy-chained through ASI connections.

The Master unit's ASI OUTPUT connector goes to the ASI INPUT connector of the ASII module in the first Slave unit.

The ASI LOOP output connector of the ASII module in the first Slave unit goes to the ASI INPUT connector of the ASI module in the next slave unit.

These ASI LOOPs continue through all EH24As at the headend.

There can be standard SDE24s in some or all of the remaining slots of the Master EH24A. If they are wanted to be sent out on the ASI output of the Master EH24A can be picked up from the ASI LOOP output connector of the ASII module of the last Slave unit in the chain.

VERY IMPORTANT: When the SDE24EAS is used in slot 6, both encoders in the SDE24EAS must be set to the lowest encoding bitrate of any other SDE24 in the entire system. This is the only way to make sure that when its stream replaces the original streams that it will still fit into all the QAM channels.

CATV Channel Frequencies

TABLE 1: CATV

CABLE TV CHANNELS	
Channel Number	Center of Channel
EIA/NCTA Numeric Equivalent	Frequency in MHz
2	57
3	63
4	69
5	79
6	85
95	93
96	99
97	105
98	111
99	117
14	123
15	129
16	135
17	141
18	147
19	153
20	159
21	165
22	171
7	177
8	183
9	189
10	195
11	201
12	207
13	213
23	219
24	225
25	231
26	237
27	243
28	249
29	255
30	261
31	267
32	273
33	279
34	285
35	291
36	297
37	303
38	309
39	315
40	321

CABLE TV CHANNELS	
Channel Number	Center of Channel
EIA/NCTA Numeric Equivalent	Frequency in MHz
41	327
42	333
43	339
44	345
45	351
46	357
47	363
48	369
49	375
50	381
51	387
52	393
53	399
54	405
55	411
56	417
57	423
58	429
59	435
60	441
61	447
62	453
63	459
64	465
65	471
66	477
67	483
68	489
69	495
70	501
71	507
72	513
73	519
74	525
75	531
76	537
77	543
78	549
79	555
80	561
81	567
82	573
83	579
84	585
85	591

CABLE TV CHANNELS	
Channel Number	Center of Channel
EIA/NCTA Numeric Equivalent	Frequency in MHz
86	597
87	603
88	609
89	615
90	621
91	627
92	633
93	639
94	645
100	651
101	657
102	663
103	669
104	675
105	681
106	687
107	693
108	699
109	705
110	711
111	717
112	723
113	729
114	735
115	741
116	747
117	753
118	759
119	765
120	771
121	777
122	783
123	789
124	795
125	801
126	807
127	813
128	819
129	825
130	831
131	837
132	843
133	849
134	855
135	861

CABLE TV CHANNELS	
Channel Number	Center of Channel
EIA/NCTA Numeric Equivalent	Frequency in MHz
136	867
137	873
138	879
139	885
140	891
141	897
142	903
143	909
144	915
145	921
146	927
147	933
148	939
149	945
150	951
151	957
152	963
153	969
154	975
155	981
156	987
157	993
158	999

Broadcast TV Channel Frequencies

TABLE 2: BC TV

VHF BROADCAST CHANNELS	
Channel Number	Center of Channel Frequency (MHz)
2	57
3	63
4	69
5	79
6	85
7	177
8	183
9	189
10	195
11	201
12	207
13	213

UHF BROADCAST CHANNELS	
Channel Number	Center of Channel Frequency (MHz)
14	473
15	479
16	485
17	491
18	497
19	503
20	509
21	515
22	521
23	527
24	533
25	539
26	545
27	551
28	557
29	563
30	569
31	575
32	581
33	587
34	593
35	599
36	605
37	611
38	617
39	623
40	629
41	635
42	641
43	647
44	653
45	659
46	665
47	671
48	677
49	683
50	689
51	695
52	701
53	707
54	713
55	719
56	725
57	731
58	737
59	743
60	749
61	755
62	761
63	767
64	773
65	779
66	785
67	791
68	797
69	803

Service / If You Need To Call For Help

SERVICE INFORMATION

You may contact the R.L. DRAKE Service Department for additional information or assistance by calling +1 (937) 746-6990, Monday through Friday, between 8:00 A.M. and 4:00 P.M. Eastern Time, except on holidays.

You may also contact the R.L. DRAKE Service Department by E-mail at the following address: TechSupport@rldrake.com or by Telefax: +1 (937) 806-1576.

Should you want to return your unit for service, package the unit carefully using the original carton or other suitable container.

Write your return address clearly on the shipping carton and on an enclosed cover letter describing the service required, symptoms or problems. Also include your daytime telephone number and a copy of your proof of purchase.

The unit will be serviced under the terms of the R.L. DRAKE HOLDINGS LLC Limited Warranty and returned to you.

IF YOU NEED TO CALL FOR HELP

Call our Customer Service/Technical Support line at +1 (937) 746-6990 between 8:00 A.M. and 4:00 P.M. Eastern Time, weekdays. Please have the unit's serial number available. We will also need to know the specifics of any other equipment connected to the unit. When calling, please have the unit up and running, near the phone if possible.

Our technician(s) will likely ask certain questions to aid in diagnosis of the problem. Also, have a voltmeter handy, if possible. R.L. DRAKE also provides technical assistance by e-mail: TechSupport@rldrake.com or by Telefax: +1 (937) 806-1576.

Many of the products that are sent to us for repair are in perfect working order when we receive them. For these units, there is a standard checkout fee that you will be charged. Please perform whatever steps are applicable from the installation sections of the Owner's Manual before calling or writing—this could save unnecessary phone charges. Please do not return the unit without contacting R.L. DRAKE first: it is preferred to help troubleshoot the problem over the phone (or by mail) first, saving you both time and money.

Inside the carton, enclose a note with your name, address, daytime phone number, and a description of the unit's problem.

The unit must be sent to the following address:

Service Department
R.L. DRAKE
9900 Springboro Pike
Miamisburg, Ohio 45342. USA

Be sure to include your street address which will be needed for UPS return. UPS Surface (Brown Label) takes 7-10 days to reach us depending on your location, Blue takes 2-3 days.

Red is an overnight service. Send the unit in a way that it can be traced if we can't verify receipt of shipment. We suggest UPS or insured postal shipment.

If the unit is still under the original owner's warranty, R.L. DRAKE will pay the cost of the return shipment to you. Our return shipping policy is that we will return it UPS Brown if received Brown or by US Mail, it will be returned Blue if received Blue or Red—or it will be returned however you prefer if you furnish the return cost for the method you select.

If You Need To Call For Help (continued)

If the unit is out of warranty, use one of the following methods for return shipment:

1) You designate billing to American Express, VISA, MasterCard or Discover card;

2) You prepay the service charges with a personal check, or

3) You specify some other method of return and payment.

When calling, the technician can estimate the repair charges for you over the phone. This is another good reason to call before sending a unit in for repair.

Typically, equipment is repaired in five to ten working days after it arrives at R.L. DRAKE if we have all the facts. If we must call you, it may take longer. R.L. DRAKE is not responsible for damage caused by lightning, nonprofessional alterations, "acts of God", shipping damage, poor storage/handling, etc. R.L. DRAKE will make note of any shipping damage upon receipt.

You will need to send proof of purchase to receive warranty service. Typically, a copy of the invoice from an R.L. DRAKE dealer will suffice. The warranty is for the original owner only and is not transferable.

Warranty

Three Year Limited Warranty

R.L. DRAKE HOLDINGS LLC warrants to the original purchaser this product shall be free from defects in material or workmanship for three (3) years from the date of original purchase.

During the warranty period R.L. DRAKE HOLDINGS LLC or an authorized Drake service facility will provide, free of charge, both parts and labor necessary to correct defects in material and workmanship. At its option, R.L. DRAKE HOLDINGS LLC may replace a defective unit.

To obtain such a warranty service, the original purchaser must:

1. Retain invoice or original proof of purchase to establish the start of the warranty period.
2. Notify R.L. DRAKE HOLDINGS LLC or the nearest authorized service facility, as soon as possible after discovery of a possible defect, of:
    a) the model and serial number,
    b) the identity of the seller and the approximate date of purchase; and
    c) A detailed description of the problem, including details on the electrical connection to associated equipment and the list of such equipment.
3. Deliver the product to R.L. DRAKE HOLDINGS LLC or the nearest authorized service facility, or ship the same in its original container or equivalent, fully insured and shipping charges prepaid.

Correct maintenance, repair, and use are important to obtain proper performance from this product. Therefore carefully read the Instruction Manual. This warranty does not apply to any defect that R.L. DRAKE HOLDINGS LLC determines is due to:

1. Improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality and specifications of the original parts.
2. Misuse, abuse, neglect or improper installation.
3. Accidental or intentional damage.

All implied warranties, if any, including warranties of merchantability and fitness for a particular purpose, terminate three (3) years from the date of the original purchase.

The foregoing constitutes R.L. DRAKE HOLDINGS LLC'S entire obligation with respect to this product, and the original purchaser shall have no other remedy and no claim for incidental or consequential damages, losses or expenses. Some states do not allow limitations on how long an implied warranty lasts or do not allow the exclusions or limitation of incidental or consequential damages, so the above limitation and exclusion may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state. This warranty shall be construed under the laws of Ohio.

For Service, contact:

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